

Plant systematics (part 2)

The Plant Kingdom *Kingdom Plantae*

Non-Vascular Plants *Bryophytes*

Liverworts

Marchantiophyta



Hornworts

Anthocerotophyta



Mosses

Bryophyta



Vascular Plants *Tracheophytes*

Spore-Producing Plants

Pteridophyte



Seed-Producing Plants

Spermatophytes



Club Mosses

Lycopodiophyta



Horsetails

Equisetophyta



Ferns

Pteridophyta



Non-Flowering Plants

Gymnosperms



Flowering Plants

Angiosperms



Conifers

Pinophyta



Cycads

Cycadophyta



Ginkgo

Ginkgophyta



Plants With One Seed Leaves

Monocotyledon (Monocots)



Plants With Two Seed Leaves

Dicotyledon (Dicots)



Seed producing plants

- Major adaptations
 - Pollen (male **gametophyte**)
 - Seeds (embryonic plant)(**male and female gametophyte** are greatly reduced in size)
- Two types
 - Gymnosperms (lack flowers, naked seeds)
 - Angiosperms (flowering plants, seeds enclosed in fruits)

النباتات المنتجة للبذور (البذرية)
التكيفات الرئيسية
حبوب اللقاح (الأمشاج الذكرية)
البذور (النباتات الجنينية)
(الأمشاج الذكرية والإنتوية مختزلة في حجم إلى حد كبير)
وهي نوعين
عاريات البذور (ليس لها ازهار والبذور عارية)
كاسيات البذور (نباتات زهرة والبذور مغلقة في الثمار)

GYMNOSPERMS

- Root, stem, leaf: present
- Well developed vascular tissue
- No true flower and fruits
- Reproductive structures called as Cones مخاريط
- Example: *Cycas*, *Pinus*, *Taxys*, *Gnetum*



Gymnosperms

- *Gymnos* means naked, *sperm* means seed: gymnosperm = naked seeds
- Gymnosperms have seeds with no covering (ie: a fruit or a seed coat). They bear woody cones that hold the seeds.
- There are 700 living species placed into four divisions: Conifers, Cycads, Ginkgos, and Gnetales



GYMNOSPERMS

Cycadophyta (Cycads) السيكادية



- **Large fernlike leaves** أوراق كبيرة تشبه اوراق السرخسيات
- **Plants are either males or females** النباتات ذكور أو إناث
- **Plants produce gametes in large strobilus** النباتات تنتج الأمشاج في مخاريط كبيرة



GYMNOPSERMS

GINKGOPHYTA (*Ginkgo biloba*) النباتات الجنبوية

- Only one species in present day يوجد نوع واحد فقط في الوقت الحاضر
- Bear male and female cones on separate plants. المخاريط الذكورية والإنثوية محمولة على نباتات منفصلة.
- Male produces pollen in strobilus-like cones. الذكر تنتج حبوب اللقاح في مخاريط أعضاء مخروطية الشكل.
- Female bears seed which develop a fleshy outer covering الأنثى يحمل البذور التي تتطور خارج الغطاء اللحمي
- Plants are resistant to air pollution النباتات مقاومة لتلوث الهواء

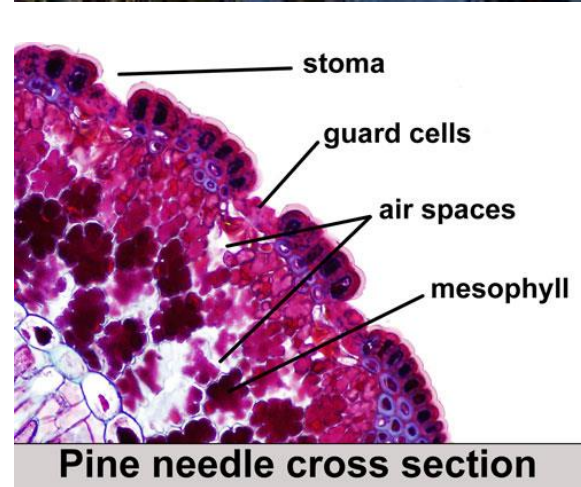


GYMNOSERMS

النباتات المخروطية

Coniferophyta
(Cone-bearing trees)

- **Cone bearing** تحمل مخروط
- **needles with thick waxy covering** الأوراق الإبرية مغطاة بغطاء شمعي سميك
- **Stomata in cavities below surface** الثغور في تجاويف تحت سطح
البذور محمولة على أسطح المخاريط
- **Seeds are carried on the surfaces of cones**
دائمة الخضرة وتكيفت مع البيئات الباردة والجافة
- **Evergreen and adapted to cold and dry habitats**



Male & Female cones



Gnetum



GYMNOPSERMS

Gnetophyta النباتات النتومية

There are three genera:

نيتم وهو نبات متسلق استوائي

1. *Gnetum*: A tropical climbing plant

الإيفيدرا (النباتات شبه شجيرية)

2. *Ephedra* (Shrub-like plants)

لويتشيا يعيش بالصحراء له جذر درني كبير). له اثنتين من الأوراق فقط وربما يعيش 100 سنة.

3. *Welwitschia* (Desert dweller with large tuberous root). Has only two leaves and may live 1000 yr.

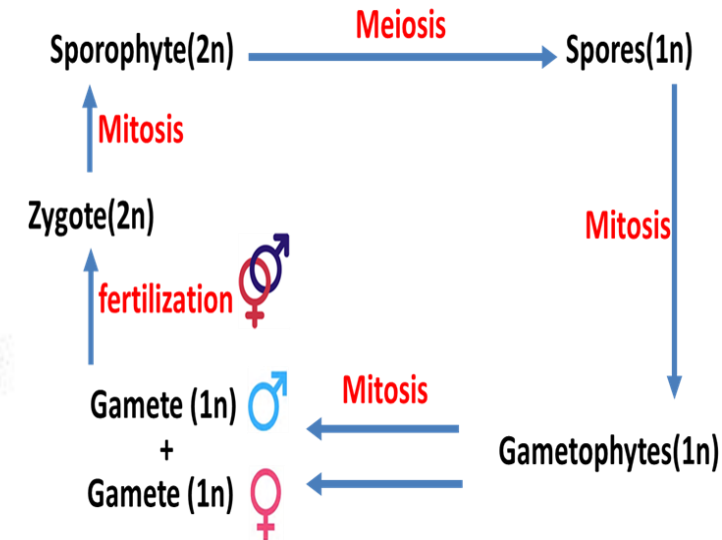
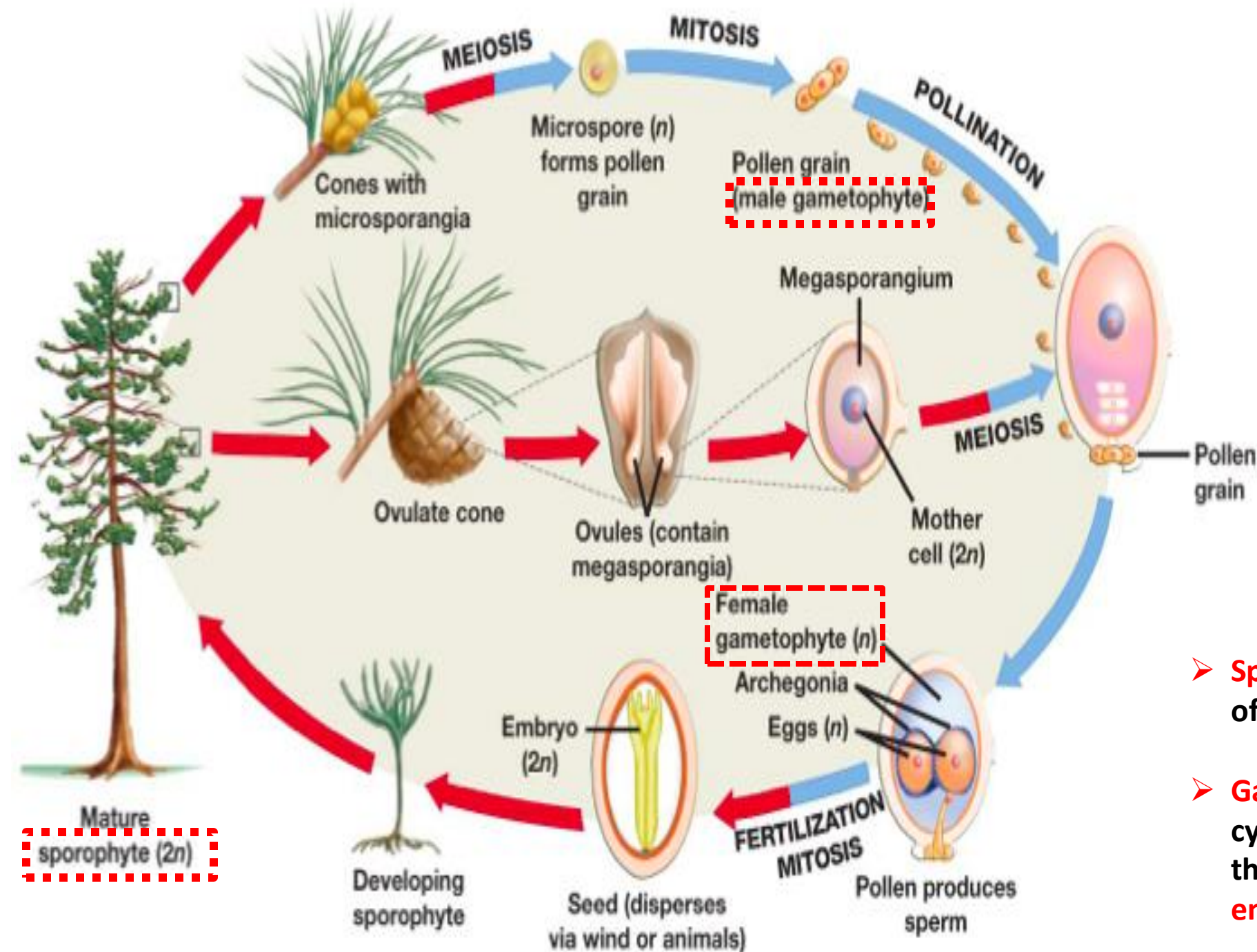


Ephedra



Welwitschia

Alternation of Generations in Gymnosperms



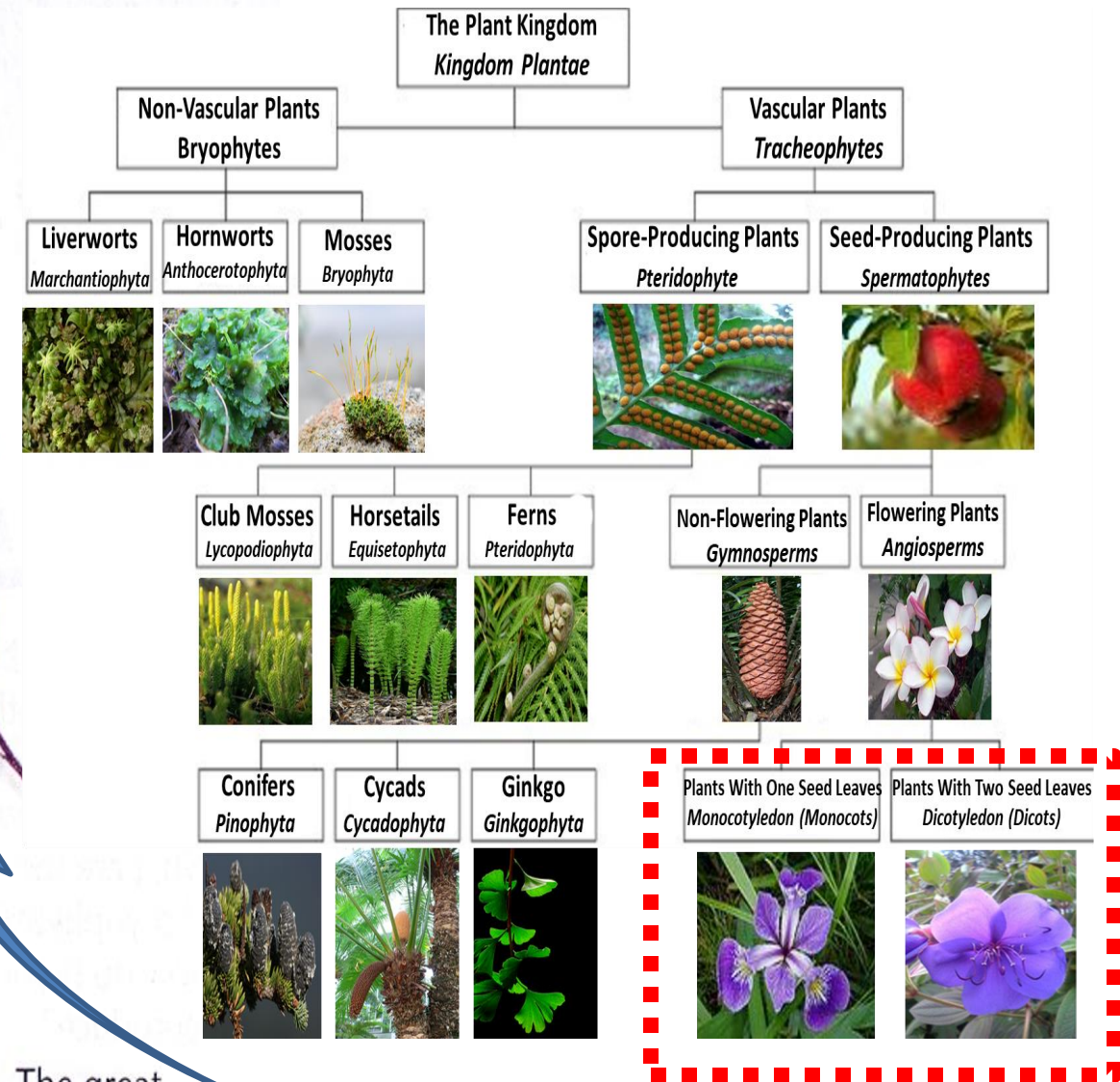
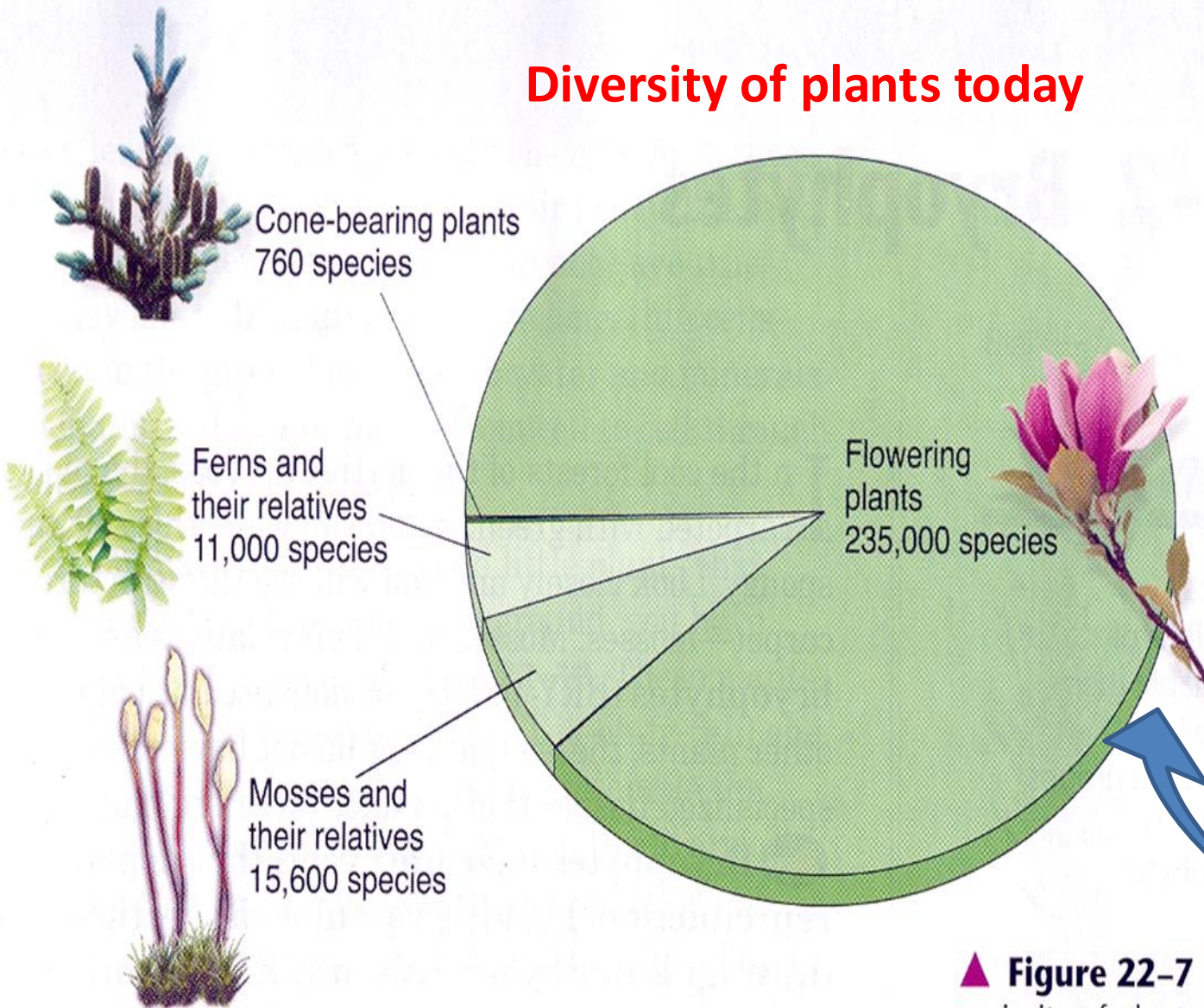
- **Sporophyte (2n)** is **dominant** phase of life cycle
- **Gametophyte (1n)** phase of life cycle is **very small**, represented by the germinated **pollen** and the **embryo** in sac.

Angiospermae

(Anthophyta - flowering plants)



Diversity of plants today

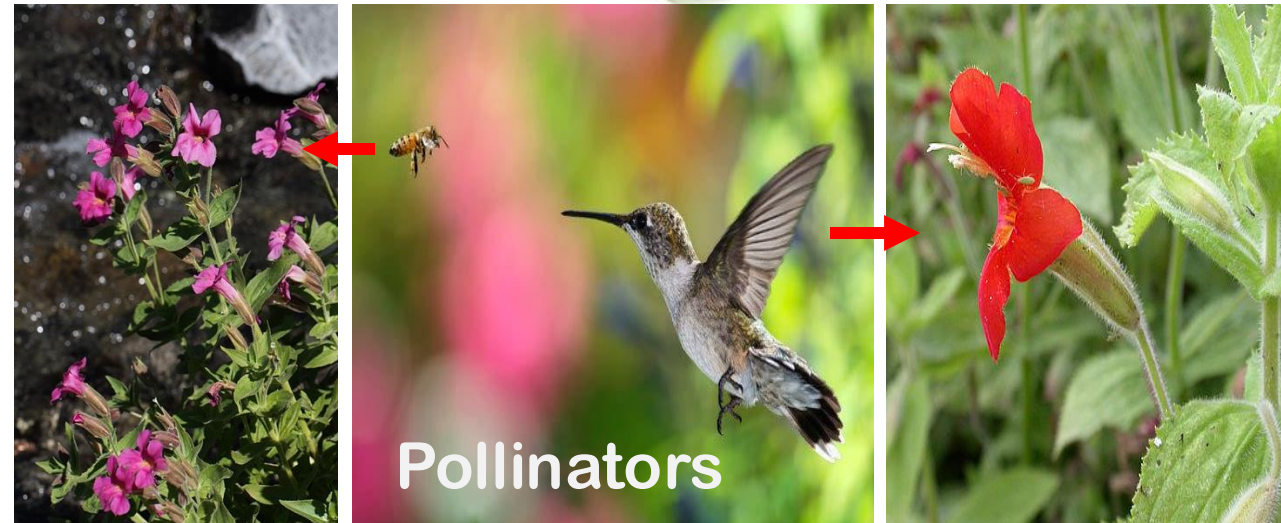
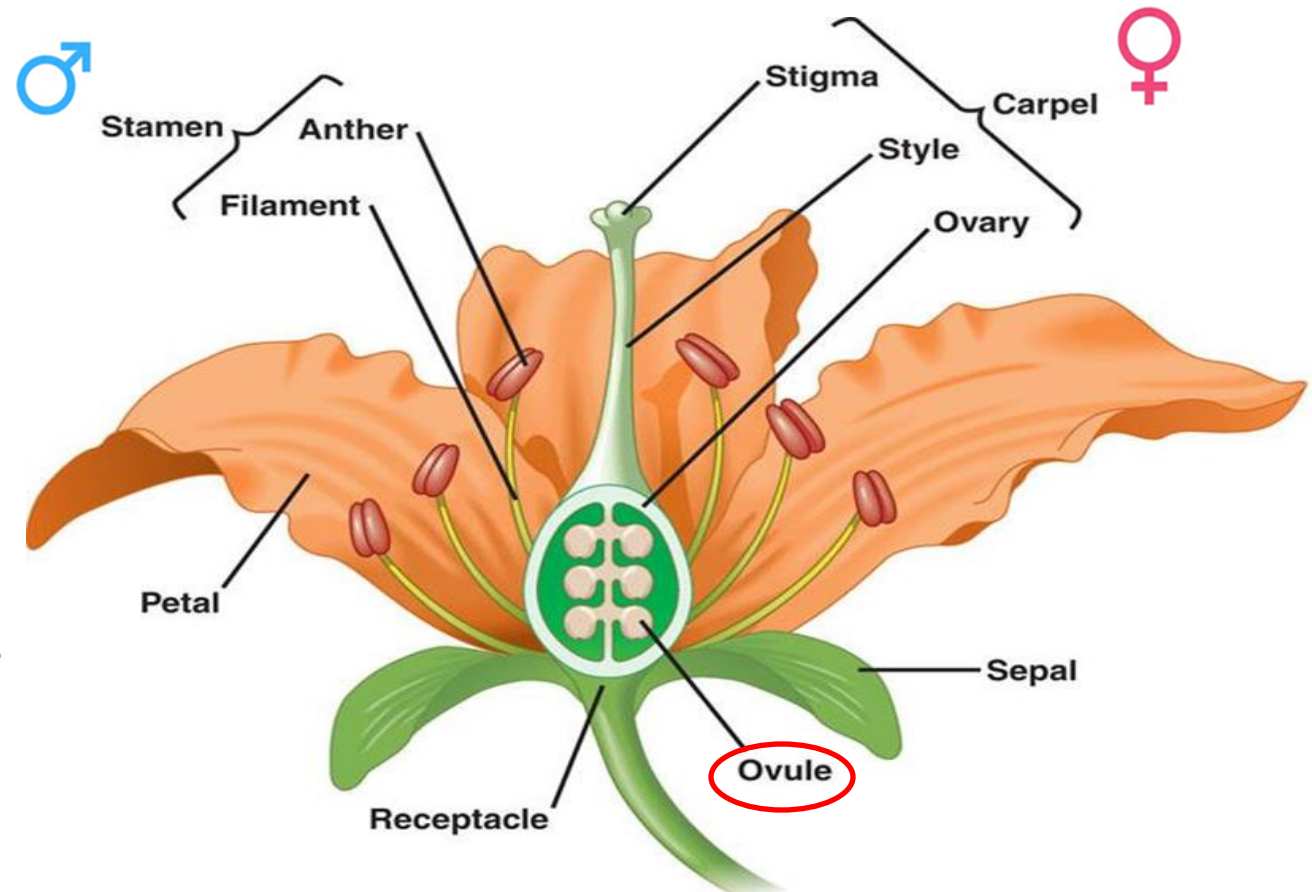


▲ **Figure 22-7** The great majority of plants alive today are angiosperms, which are also known as flowering plants. **Interpreting Graphics** What is the second largest group of plants?

Angiospermae

(Anthophyta – flowering plants)

- **Angiosperms** all produce **flowers** containing the **sexual** reproduction structures.
- The angiosperms (*angios*=**covered**, *sperm* = **seed**) produce fruits and seeds.
- There are presently 235,000 known living flowering plants species.
- **Flowers**, ovaries, **pollinators** (insects, etc.)



Inflorescence types

- An inflorescence is an arrangement of one or more flowers on a floral axis.

1

Simple :

One flower at the tip of a stem



2

Compound:

Two or more flowers in every inflorescence



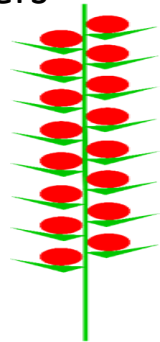
Raceme: عنقودية

Unbranched, with pedicellate flowers



Spike: سنبله

A Simple raceme with sessile flowers



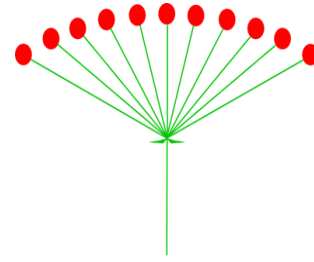
Panicle: دالية

A compound raceme, branches are themselves branched



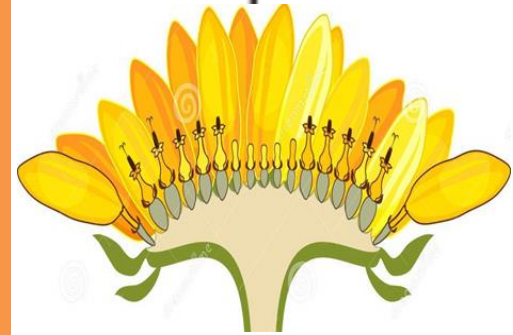
Umbel: خيمية

a raceme in which all pedicels arise from a common point.

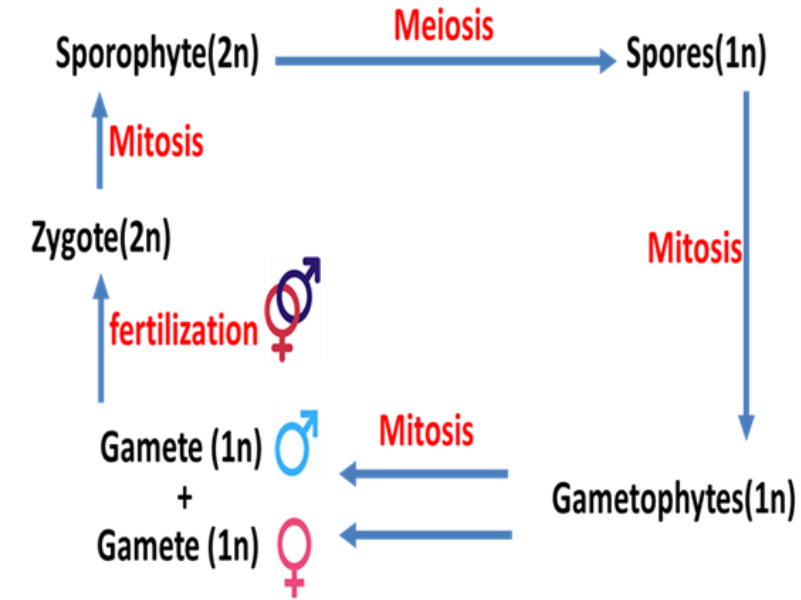
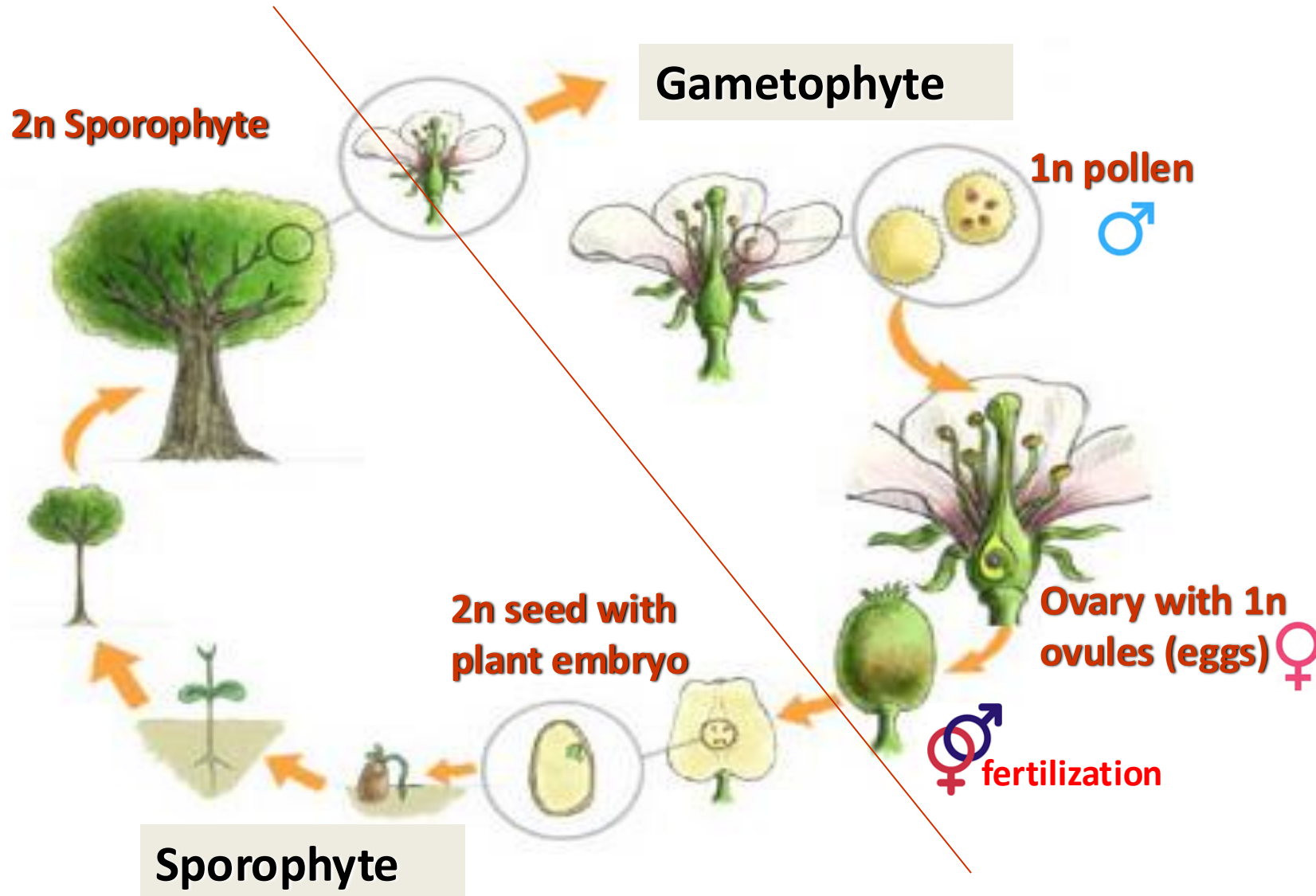


Head: رأسية

A contracted raceme, with sessile flowers that are borne on an enlarged head.



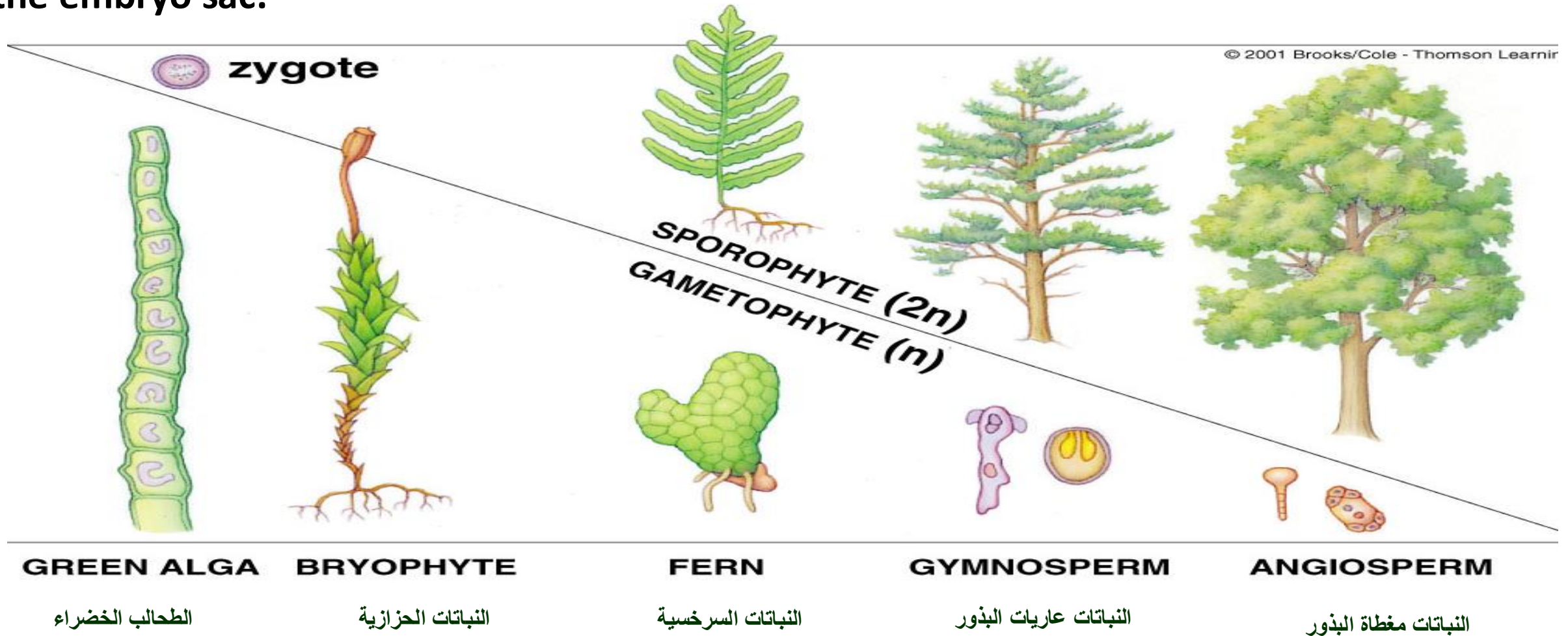
Alternation of Generations



- **Sporophyte (2n)** is **dominant** phase of life cycle
- **Gametophyte (1n)** phase of life cycle is **very small**, represented by the germinated **pollen** and the **embryo** in sac.

Switch to Sporophyte Dominance

In the seed plants, the **sporophyte** phase is more **prominent** than the **gametophyte**, and the **gametophytes** are very **reduced in size** and are represented by the germinated pollen and the embryo sac.



Seed Dispersal



Water

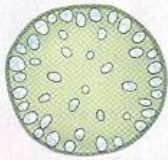
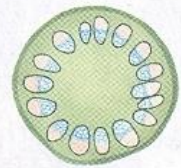


Winds



Animals

Characteristics of Monocots and Dicots

	Monocots	Dicots
Seeds	Single cotyledon 	Two cotyledons 
Leaves	Parallel veins 	Branched veins 
Flowers	Floral parts often in multiples of 3 	Floral parts often in multiples of 4 or 5 
Stems	Vascular bundles scattered throughout stem 	Vascular bundles arranged in a ring 
Roots	Fibrous roots 	Taproot 

Flowering Plants *Angiosperms*



Plants With One Seed Leaves
Monocotyledon (Monocots)



Plants With Two Seed Leaves
Dicotyledon (Dicots)



Habit of plant

Herb. A usually low, soft or coarse plant with annual aboveground stems.

Shrub. A much-branched woody perennial plant usually without a single trunk.

Tree. A tall, woody perennial plant usually with a single trunk.

Vine or Liana. An elongate, weak-stemmed, often climbing annual or perennial plant, with herbaceous or woody texture.



shrubs



Tree



Vine



LEAF



There are large number of terminology leaf based on:

- Margin حافة
- Apex القمة
- Base القاعدة
- Venation التفرق
- Arrangement ترتيب
- Petiole العنق
- Modifications تحورات

Types of Roots



Fibrous root system



Tap root



Prop roots



Adventitious roots

PLANT SYSTEMATICS



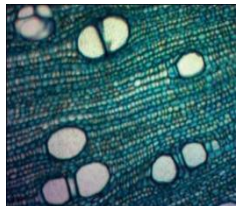
Karl von Linne (1707-1778)

- Taxonomy: The science of classification.
- Plant taxonomy: The science of classification of plants.
- Swedish botanist Carolus Linnaeus introduced **Binomial Nomenclature**.
- **Binomial nomenclature** = Uses two Latin words to indicate the genus and the species. The first word is the genus and the second word is the species. (Scientific name)
- Example- the botanical name of dates is *Phoenix dactylifera*

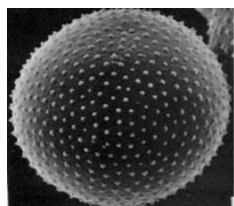
Morphology to Molecules



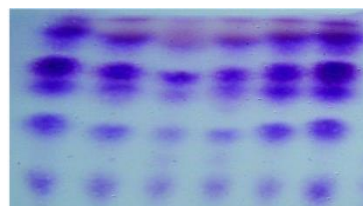
Morphology



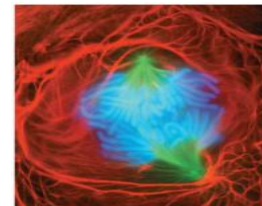
Anatomy



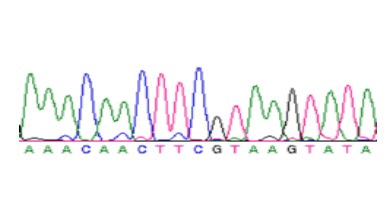
Pollen



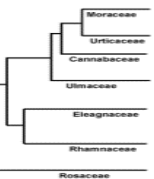
Chemistry



Chromosomes

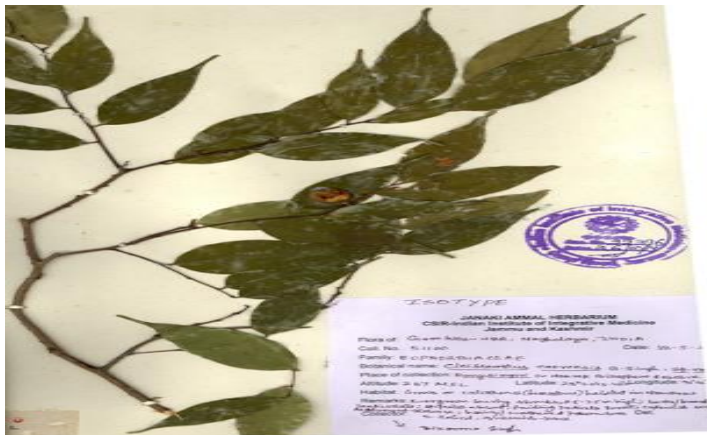
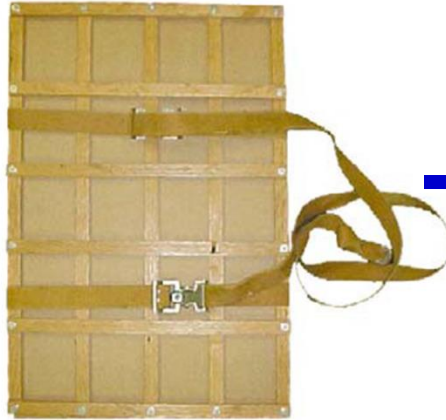


DNA / Molecular taxonomy

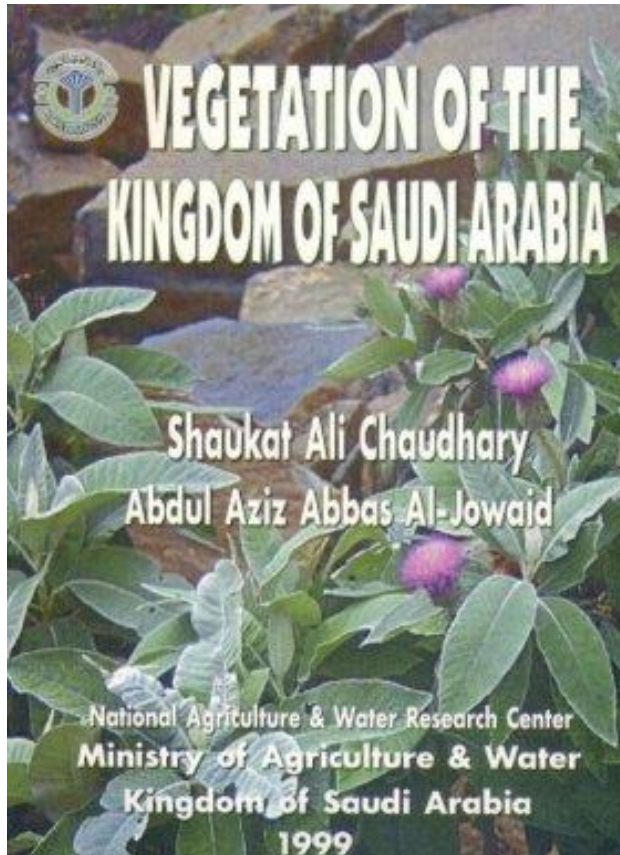


Plant collecting and Documentation

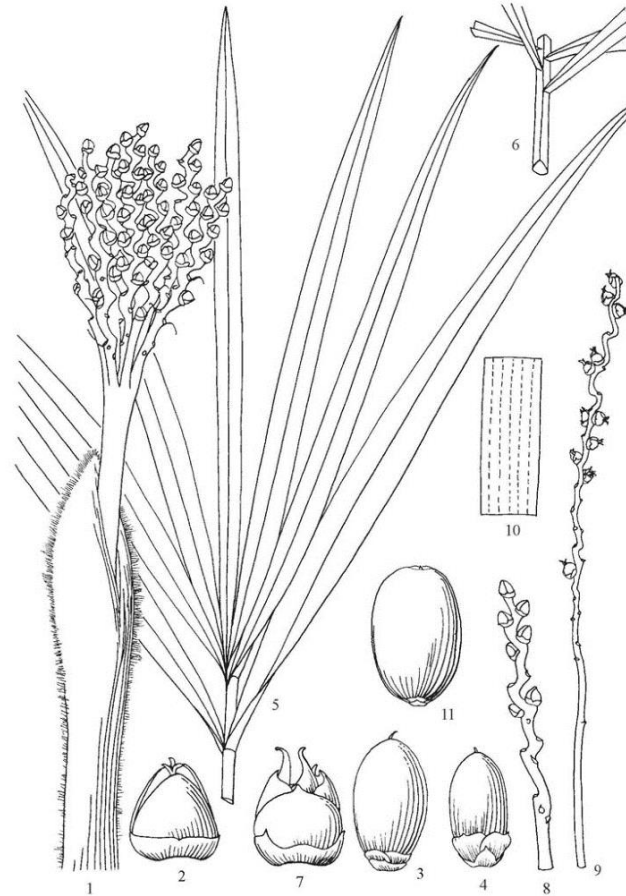
- A **HERBARIUM** is a collection of dried plants systematically named and arranged for ready reference and study.
- To make a herbarium specimen, the plant is collected, and notes are made about it. The plant is then pressed until dry between blotters that absorb moisture and mounted onto a herbarium sheet with a suitable label.



The FLORA is the main Resources of Taxonomic Information



Flora = it is the documentation of plants occurring in a particular region.



**Description of
plant need
taxonomic
terminology**

Phoenix dactylifera Linnaeus, Sp. Pl. 2: 1188. 1753.

Stems solitary or clustered and then with few shoots, to 30 m tall, to 50 cm in diam., rough with persistent, diamond-shaped leaf bases. Leaves 3-5 m; sheath and petiole to 1 m; rachis 1-2 m; acanthophylls many per side of rachis; pinnae to 200 per side of rachis, linear, irregularly arranged and spreading in different planes; middle pinnae to 40 × 2 cm. Male inflorescences erect, to 1 m, with many rachillae, these ca. 30 cm; female inflorescences erect, becoming pendulous, to 2 m, with to 150 rachillae, these to 40 cm. Fruits variable in shape, usually oblong, to 7 × 3 cm, brown or black; endosperm homogeneous.